# Gravina Access Project

## *Traffic Assessment*
## *Technical Memorandum*

## *Draft*

**Agreement 36893013**
**DOT&PF Project 67698**
**Federal Project ACHP-0922(5)**

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# 1.0 Introduction

This technical memorandum is prepared as a support document for the on-going assessment of alternatives to improve access between Revilla Island and Gravina Island. Analysis is provided for each access alternative for three different economic growth scenarios. The alternatives include the No Build Alternative, three ferry alternatives, three bridge alignment alternatives directly between Ketchikan and Gravina Island, and two bridge options across Pennock Island.

The scenarios for overall economic activity in the Ketchikan Gateway Borough include low, medium, and high levels of economic growth (see Section 4.1). These economic scenarios were combined with each of the alternatives studied for this project to produce development scenarios. Economic growth, forecast development on Gravina Island, and convenience of access were combined to produce a set of traffic projections for each project alternative. These projections are contained in Tables 1 and 2, and are presented in detail in a technical memorandum entitled *Gravina Access Project Traffic Projections Technical Memorandum* (HDR 2002).

**Table 1. Traffic Projections: One-Way Trips Across Tongass Narrows, People per Day in 2025**

| Access Alternative | Overall Economic Activity in the Borough | | |
|---|---|---|---|
| | Low | Medium | High |
| **Bridge (except bridge across Pennock Island)** | 2,700 | 4,300 | 6,200 |
| **Bridge (across Pennock Island** | 2,700 | 5,100 | 8,100 |
| **Improved Ferry** | 1,400 | 1,600 | 2,700 |
| **No Build** | 1,300 | 1,350 | 1,400 |
| **Reference** | There were 1,056 passenger trips per day on the ferry in 1999. | | |

Source: The reference number is from *Ketchikan 2020 & Gravina Access Project: Existing Conditions Demographic and Socioeconomic Analysis* (Technical Memorandum), and forecast numbers are from the Northern Economics spreadsheet model. (Passenger trips in 1999 were based on tallies kept by ferry operators. This information is maintained in a database by the Ketchikan airport and presented in the *Existing Conditions* report.)

Table 2 shows the traffic forecasts for vehicles in 2025 for the different access alternatives under consideration at different levels of possible economic activity in the Ketchikan Gateway Borough. The traffic projections for the bridge alternatives to Gravina Island from the south, across Pennock Island (Alternatives F1 and F3), result in more trips because of the additional development that could occur on Pennock Island. It is important to note, however, that this alternative could be constructed without access to Pennock Island land. Though Alternatives F1 and F3 cross Pennock Island, additional access from the road connecting the bridges to other parts of the island is not included in the scope of the Gravina Access Project. Any additional roads on Pennock Island would be the responsibility of the local government.

**Table 2. Traffic Projections: One-Way Trips Across Tongass Narrows, Vehicles per Day in 2025**

| Access Alternative | Overall Economic Activity in the Borough | | |
|---|---|---|---|
| | Low | Medium | High |
| **Bridge (except bridge across Pennock Island)** [1] | 2,100 | 3,300 | 4,800 |
| **Bridge (across Pennock Island)** | 2,100 | 4,200 | 6,700 |
| **Improved Ferry** | 400 | 600 | 1,400 |
| **No Build** | 300 | 500 | 700 |
| **Reference** | There were 252 vehicle trips per day on the ferry in 1999. | | |

Source: The reference number is from *Ketchikan 2020 & Gravina Access Project: Existing Conditions Demographic and Socioeconomic Analysis* (Technical Memorandum), and forecast numbers are from the Northern Economics spreadsheet model. (Vehicle trips in 1999 were based on tallies kept by ferry operators. This information is maintained in a database by the Ketchikan airport and presented in the *Existing Conditions* report.)

This memorandum analyzes these traffic projections for their impact on the background traffic volumes and street network on Revillagigedo Island. Intersection Level of Service (LOS) was calculated for the afternoon peak hour based on methodologies outlined in the 2000 *Highway Capacity Manual* published by the Transportation Research Board.

## 2.0 Existing Conditions

### 2.1 Geometry

Tongass Avenue is predominantly a two-lane facility, with parking, that runs from the northwest to the southeast along the Tongass Narrows. For some stretches of road, however, additional lanes have been added at the approaches to intersections to accommodate the increased traffic. Traffic signals are provided at the intersections with Carlanna Lake Road, Jefferson Street, Washington Street, and Dock Street. The other intersections involved in the analysis are controlled by stop signs (see the traffic maps in Appendix A).

Third Avenue currently runs from Tongass Avenue to Washington Street, and is scheduled for extension to the east at the Schoenbar Road intersection. Until this upgrade is completed, Tongass Avenue is the only cross-town road in the study area.

### 2.2 Traffic Volumes

Traffic volumes for the project area were gathered from two sources. Manual turning movement counts at the intersections between Bryant Street and Schoenbar Road (see the traffic maps in Appendix A for intersection locations) were collected for this project by HDR Alaska, Inc. during August of 2000. Counts at other locations were provided by the Alaska State Traffic Engineering Department for afternoon peak periods. Manual counts were conducted during the morning and afternoon peak periods, but it was clear from the observations that traffic conditions were more severe during the afternoon peaks. Therefore, the analysis focused on data from the afternoon peak traffic periods. The afternoon peak hour turning movement counts are provided in Appendix A.

# 3.0 Future Conditions

## 3.1 Access Alternatives

The following is a brief description of the alternatives studied for this project and the assumptions (if any) that were made for purposes of the traffic analysis:

- Bridge Alternatives C3(a) and C3(b): The C3(a) and C3(b) alternatives connect to Tongass Avenue at the existing Signal Road intersection location. There is currently a traffic signal at this location. Signal Road would need to be relocated to connect to the new C3(a)/C3(b) alignment.

- Bridge Alternative C4: The C4 alternative connects to Tongass Avenue directly across from the current three-legged intersection to the Existing Ferry Access.

- Bridge Alternative D1: The D1 alternative connects to Tongass Avenue at the same location as a current local access street. This street would be reconnected to the D1 alignment at the top of the hill. The intersection with Tongass Avenue is presently a three-legged, unsignalized intersection.

- Bridge Alternative F1: The F1 alternative would intersect with South Tongass Highway at a new location, and the intersection would be unsignalized. The stem of this three-legged intersection would begin to the east, and then back track west across the Tongass Narrows to gain altitude for a high bridge.

- Bridge Alternative F3: The F3 alternative would intersect with South Tongass Highway at a new location, and the intersection would be unsignalized. The stem of this three-way intersection would cross directly west towards Gravina.

- Ferry Alternative G2: This alternative would convert the seaplane base on Peninsula Point into a new ferry terminal. The intersection with Tongass Avenue would be in the same location as the existing three-legged intersection, and would be unsignalized. This alternative would provide ferry service to Gravina Island from Peninsula Point in addition to the existing ferry service.

- Ferry Alternative G3: This alternative adds a ferry terminal that would connect with Tongass Avenue at Jefferson Street. A traffic signal is currently in place at this intersection and no significant change would be required. This new ferry service would be provided in addition to the existing ferry service.

- Ferry Alternative G4: This alternative would add another ferry terminal and additional parking at the current terminal location—in essence, doubling the ferry capacity at the current location. Additional parking would be to the north, but access to Tongass Avenue would most likely be in the same location and manner as the current access for the existing facility.

### 3.2 Transportation Improvements

Other than the proposed project, the only other significant transportation improvement planned in the study area is the extension of Third Avenue to Schoenbar Road (see Section 2.1). While this upgrade is not expected to significantly affect route choice to Pennock Island (the F1 and F3 Alternatives), it will afford reasonable route options for the other alternatives. The effects of the Third Avenue Extension are accounted for in the trip assignment process discussed below.

## 4.0 Methodology and Assumptions

### 4.1 Economic Conditions

The Borough-wide economic forecasts presented in the *Ketchikan-Gateway Borough Economic Forecasts*, August 2002 draft, are summarized below for the low, medium, and high economic scenarios used in this traffic assessment.

#### *4.1.1 Low Growth and Development Economic Scenario*

- Downward trend in Tongass timber harvests, resulting in downward trends in employment in the forest products sector through 2005, followed by modest timber employment growth of 0.5 percent per year.
- Employment in the seafood sector declines through 2010, followed by a 0.5 percent annual decrease.
- Shipyard operations cease in 2006.
- Modest growth in expenditures and low growth (less than 1 percent per year through 2005, 2 percent through 2010, and 1 percent for the remainder of the study period) in employment related to the visitor and tourism industry.
- Funding and assistance from the state declines along with the timber and seafood sectors in the near term (through 2010), but stabilizes in the longer term with increasing population and demand for new services.
- Population in the Borough is expected to reach 14,000 by the year 2025.

#### *4.1.2 Medium Growth and Development Economic Scenario*

- Tongass timber harvests stabilize and the veneer plant reopens in 2003.
- No significant change in seafood harvesting, and stable employment after 2010.
- Modest to moderate increases in employment related to shipyard activities; employment might increase by 25 employees by 2009 and then increase to 2 percent annually after that time.

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- Tourism expenditures to increase at 2 percent per year annually to 2005, then increase to 3 percent per year to 2010. Tourism expenditures decline to 2 percent per year after 2010.
- Little change in spending and employment related to state government, although local government employment increases due to population growth and federal government employment increases due to counter-terrorism activities.
- Population in the Borough is expected to reach 18,300 by the year 2025.

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### *4.1.3 High Growth and Development Economic Scenario*

- Timber harvests increase from current levels; industry growth includes increased output at the veneer plant and a centralized sort yard. Overall employment in the sector expected to increase by 0.5 percent per year in the near term, then by 1.0 percent per year.
- Nontraditional fisheries are developed, along with value added processing facilities. Employment in the seafood sector expected to grow at 1 percent per year.
- New ship lift and other capital improvement in the ship yard result in 62 more jobs by 2005 and employment growth of 3 percent per year from 2006 to 2025.
- Significant increases in tourism expenditures with the addition a cruise ship dock and new venues; 1,815 jobs result in trade and services sector by 2025.
- Federal, state, and local spending and employment begin to increase due to population increase and other factors.
- Population in the Borough is expected to reach 24,500 by the year 2025.

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Deleted: remain stable through 2005, then increase from 2005-2025 to keep pace with increased activity in the timber, seafood, and tourism sectors.AMHS and IFA use new ferry terminal on Gravina Island or northeast end of Tongass Narrows. In addition, AMHS continues to use Ketchikan terminal.
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## 4.2 Traffic Forecasts

Traffic forecasts consist of two components. One is background traffic growth—independent of the project—(herein represented as the No Build Alternative) and the other is the additional traffic expected from the project.

- No Build Traffic Volumes – The compounded background growth rate of 1.5 percent per year used in this analysis was taken directly from the *Tongass Avenue Improvements Revised Environmental Assessment*, prepared in February 1996. This factor was applied to existing traffic to the year 2025 to develop the No Build set of traffic volumes (or the background traffic growth). Analysis showed that the difference between the low, medium, and high growth scenarios was so small (a difference of 200 trips per day, or 20 trips in the peak hour between medium and either low or high) that only one No Build scenario (medium) was analyzed. The No Build traffic map is included in Appendix A (see Map 2).

- Build Traffic Volumes – Traffic expected from the project is estimated in the Gravina Access Project Traffic Projections Technical Memorandum (HDR 2002). The report provides projections for twelve future cases, including each of three economic forecast scenarios (low, medium, and high) for each of four alternatives, which include No Build, improved ferry alternatives (G2, G3, and G4), bridges across Pennock Island (F1 and F3), and any other bridge alternatives [C3(a), C3(b), C4, and D1].

  The projections presented in that technical memorandum reveal that the improved ferry alternatives (G2, G3, and G4) result in a range of 40 to 140 hourly trips for the three economic scenarios. These trips represent vehicles actually crossing the narrows. For each of the ferry alternatives (as well as existing conditions and the No Build Alternative) drop-off/pick-up trips to the ferries must also be estimated. These are vehicle trips with a driver who either drops of or picks up at least one passenger, and then continues to another destination without crossing the narrows. This calculation was derived using the following methodology:

  - The total number of passenger crossings from Table 1 is the base.
  - From the total number of passenger crossings, subtract the product of the corresponding vehicle crossings from Table 2 and 0.3. This assumes a vehicle occupancy of 1.3. Since the driver of a vehicle is not included as a passenger, however, the product represents additional passengers arriving and crossing the narrows in a vehicle.
  - The difference in the subtraction above represents the number of passengers who arrive by vehicle, but cross on foot (i.e., drop-off/pick-up passengers).
  - A conservative estimate would be that each drop-off/pick up vehicle is carrying only one foot-passenger. Therefore, each foot passenger identified in the preceding step represents one non-crossing vehicle at the ferry terminal.
  - The calculation then becomes the number of pedestrian crossings, minus the product of corresponding vehicle crossings and 0.3; this value represents the number of passengers crossing by foot, which is also assumed to represent the number of drop-off/pick-up vehicles.

  Bridge alternatives C3(a), C3(b), C4, and D1each result in a range of 210 to 480 hourly trips. Bridge alternatives F1 and F3 result in the highest trip generation, ranging from 210 to 670 hourly trips for the three development scenarios. It was assumed that the No Build traffic projections between Gravina and Revillagigedo Islands were included in the background growth of 1.5 percent per year; this projected traffic volume was subtracted from the volumes projected for the build alternatives to prevent double counting.

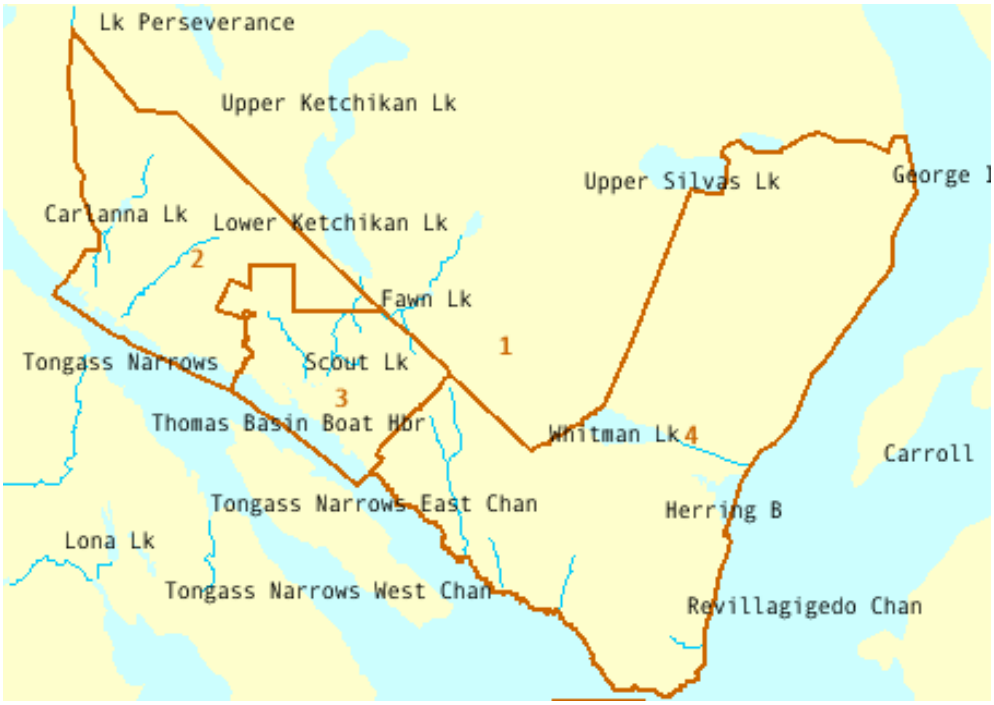
### 4.3 Trip Distribution

Populations within the four census tracts on Revillagigedo Island were used as a basis for the projected distribution of trips to and from Gravina Island. The percent of each tract to the total was assumed to approximate the percent of project-related trips that would originate from that area. The populations and resulting percentages are summarized in Table 3. Figure 1 shows the Ketchikan Gateway Borough census tract locations.

**Table 3. 2000 Population Data by Census Tract**

| Census Tract | Population | Percent |
|---|---|---|
| **1** | 3,811 | 27 |
| **2** | 4,898 | 34 |
| **3** | 3,024 | 22 |
| **4** | 2,337 | 17 |
| **Total** | 14,070 | 100 |

**Figure 1. Ketchikan Gateway Borough Census Tract Locations**




Note: The remaining areas of the Ketchikan Gateway Borough (not shown here) are all included in Census Tract 1.

## 4.4 Trip Assignment

Based on the assumption of distributing trips by census tract percentage (above) and the local roadway system, including an assumption that the Third Avenue Extension will be constructed by the year 2025, the following assignments were made for the new trips expected from the project. It has further been assumed, for the improved ferry alternatives, that only airport-related traffic could use the Existing Ferry Access (because of FAA funding restrictions).

Five trip assignment patterns have been established for the build alternatives:

- G2/Existing Ferry Access Alternative pattern
- G3/Existing Ferry Access Alternative pattern
- G4/Existing Ferry Access Alternative pattern
- C3(a), C3(b), C4, and D1 Alternatives pattern
- F1 and F3 pattern

Alternatives C3(a), C3(b), C4, and D1 were grouped together because it was assumed for the analysis that the route choices and traffic levels for these alternatives would be similar. Alternatives F1 and F3 were grouped together for the same reason.

### *4.4.1 Ferry Alternative G2/Existing Ferry Access*

Trip Assumptions for G2:

Tract A1, Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest.

Tract A2, Airport Traffic – 1/5 of trips that would otherwise have used the Existing Ferry Access location (G4) would instead use the G2 location.

Tract A3, Airport Traffic – 1/5 of trips that would otherwise have used the Existing Ferry Access location (G4) would instead use the G2 location.

Tract A4, Airport Traffic – 1/5 of trips that would otherwise have used the Existing Ferry Access location (G4) would instead use the G2 location.

Tract A1, Non-Airport Traffic – 1/3 would arrive along Tongass Avenue from the northwest, 2/3 would arrive along Tongass Avenue from the southeast.

Tract A2, Non-Airport Traffic –All would arrive along Tongass Avenue from the southeast.

Tract A3, Non-Airport Traffic –1/4 would arrive along Third Avenue to Tongass Avenue, 3/4 would arrive along Tongass Avenue from the southeast.

Tract A4, Non-Airport Traffic – All traffic would arrive along Tongass Avenue from the southeast.

Trip Assumptions for the Existing Ferry Access:

Tract A1, Airport Traffic – 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2, Airport Traffic – 4/5 would arrive along Tongass Avenue from the southeast.

Tract A3, Airport Traffic – 1/5 would arrive along Third Avenue to Tongass, 3/5 would arrive along Tongass Avenue from the southeast.

Tract A4, Airport Traffic – 4/5 would arrive along Tongass Avenue from the southeast.

### *4.4.2 Ferry Alternative G3/Existing Ferry Access*

Trip Assumptions for G3:

Tract A1, Airport Traffic – 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2, Airport Traffic – 2/5 would arrive along Tongass Avenue from the southeast, 1/10 would arrive along Tongass Avenue from the northwest.

Tract A3, Airport Traffic – 1/8 would arrive along Third Avenue to Tongass Avenue to Jefferson Street, 3/8 would arrive along Tongass Avenue from the southeast.

Tract A4, Airport Traffic – 1/2 would arrive along Tongass Avenue from the southeast.

Tract A1, Non-Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2, Non-Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A3, Non-Airport Traffic – 1/4 would arrive along Third Avenue to Tongass, 3/4 would arrive along Tongass Avenue from the southeast.

Tract A4, Non-Airport Traffic – All traffic would arrive along Tongass Avenue from the southeast.

Trip Assumptions for the Existing Ferry Access:

Tract A1, Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest.

Tract A2, Airport Traffic – 2/5 would arrive along Tongass Avenue from the northwest, 1/10 would arrive along Tongass Avenue from the southeast.

Tract A3, Airport Traffic – 1/8 would arrive along Third Avenue to Tongass, 3/8 would arrive along Tongass Avenue from the southeast.

Tract A4, Airport Traffic – 1/2 would arrive along Tongass Avenue from the southeast.

### *4.4.3 Ferry Alternative G4/Existing Ferry Access*

Trip Assumptions for G4/Existing Ferry Access:

Tract A1, Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2, Airport Traffic – 1/5 would arrive along Tongass Avenue from the northwest, 4/5 would arrive along Tongass Avenue from the southeast.

Tract A3, Airport Traffic – 1/4 would arrive along Third Avenue to Tongass, 3/4 would arrive along Tongass Avenue from the southeast.

Tract A4, Airport Traffic – All would arrive along Tongass Avenue from the southeast.

Tract A1, Non-Airport Traffic – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2, Non-Airport Traffic – 1/5 would arrive along Tongass Avenue from the northwest, 4/5 would arrive along Tongass Avenue from the southeast.

Tract A3, Non-Airport Traffic – 1/4 would arrive along Third Avenue to Tongass, 3/4 would arrive along Tongass Avenue from the southeast.

Tract A4, Non-Airport Traffic – All would arrive along Tongass Avenue from the southeast.

### *4.4.4 Bridge Alternatives C3(a), C3(b), C4, and D1*

Trip Assumptions for C3(a), C3(b), C4, and D1:

Tract A1 – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2 – 1/5 would arrive along Tongass Avenue from northwest, 4/5 would arrive along Tongass Avenue from the southeast.

Tract A3 – 1/4 would arrive along Third Avenue to Tongass, 3/4 would arrive along Tongass Avenue from the southeast.

Tract A4 – All traffic would arrive along Tongass Avenue from the southeast.

#### *4.4.5 Bridge Alternatives F1 and F3*

Trip Assumptions for F1 and F3:

Tract A1 – 1/2 would arrive along Tongass Avenue from the northwest, 1/2 would arrive along Tongass Avenue from the southeast.

Tract A2 – All traffic would arrive along Tongass Avenue from the northwest.

Tract A3 – All traffic would arrive along Tongass Avenue from the northwest.

Tract A4 – 1/4 would arrive along Tongass Avenue from the northwest, 3/4 would arrive along Tongass Avenue from the southeast.

## 5.0 Traffic Analysis

An analysis of traffic data was conducted for the existing, No Build, and Build conditions. Twelve study area intersections were analyzed between Bryant Street and Deermount Street for existing conditions for the No Build Alternative to develop a basis upon which future analyses can be compared. Data analysis has been conducted for the afternoon peak hour, as this places greater demands on the roadway system that the morning peak hour. Selected intersections for each build alternative were analyzed (see the traffic maps in Appendix A). It was found that the traffic generated by the ferry improvement alternatives was not significant enough to impact the local roadway system. For these alternatives, the analysis is limited to the intersections directly providing access to the ferries.

### 5.1 Methodology

Intersection LOS analysis was conducted using methodologies described in the 2000 *Highway Capacity Manual (HCM)*. LOS is an index of the quality of traffic flow, ranging from A (least congested) to F (most congested). At intersections, LOS is defined in terms of average delay per vehicle. The relationship between LOS and delay is summarized in Table 4.

The range of delay is lower for unsignalized intersections than for signalized intersections because drivers expect different performance levels for each type of intersection. That is, motorists expect to stop at signalized intersections more often than at unsignalized intersections.

The 2000 HCM methodology reports a composite result for signalized intersections, but for unsignalized locations, results for individual approaches are reported separately.

**Table 4. Level-Of-Service Criteria For Intersections**

| **Level of Service** | **Signalized Intersection Criteria** Average Total Delay (Seconds per Vehicle) | **Unsignalized Intersection Criteria** Average Total Delay (Seconds per Vehicle) |
|---|---|---|
| A | ≤ 10.0 | ≤ 10.0 |
| B | 10.1 to 20.0 | 10.1 to 15.0 |
| C | 20.1 to 35.0 | 15.1 to 25.0 |
| D | 35.1 to 55.0 | 25.1 to 35.0 |
| E | 55.1 to 80 | 35.1 to 50.0 |
| F | > 80 | > 50 |

Source: *Highway Capacity Manual*, Transportation Research Board; Washington, DC; 2000

## 5.2 Results

### *5.2.1 Existing Conditions*

The *Tongass Avenue Improvements Environmental Assessment*, prepared for the Alaska Department of Transportation and Public Facilities in 1996, also included a traffic analysis of the afternoon peak hour for existing (then 1992) and No Build (then 2017) conditions. A direct comparison of results for intersections common to both that and this document exhibits some similarities, but the comparison is not valid for several reasons. First, the study years are different. The 1996 document references 1992 and 2017 as the existing and future design years. The Gravina Access project analysis years are 2000 and 2025, respectively. In addition, the traffic analysis software has been significantly modified. The Tongass Avenue environmental assessment analysis could have been conducted following a *Highway Capacity Manual* version no later than 1994. Since that time, the *Highway Capacity Manual* has been revised twice, in 1997 and the existing 2000 version. The difference in study years, much-changed socioeconomic conditions, and different methodologies for intersection analysis are all factors that combine to make a direct comparison of results an invalid exercise.

The intersections analyzed for LOS under the three development scenarios (low, medium, and high economic growth) include Tongass Avenue intersections with (see Figure 2):

- Deermount Street
- Bawden Street
- Main Street
- Mission Street
- Dock Street
- Schoenbar Road
- Washington Street
- Jefferson Street
- Third Avenue
- Carlanna Lake Road
- Bryant Street
- Existing Ferry Access

At Schoenbar Road, southbound left turns from Schoenbar, and northbound traffic from the Taquan Air Drive currently operate at LOS F, although each move represents less than 10 peak hour vehicles. Southbound right turns operate at borderline LOS C/D. The remaining moves on Tongass Highway operate at LOS A and B. At Bryant Street, southbound lefts from Bryant Street operate at LOS D, with the remaining moves at LOS A and B. All other intersections presently operate at LOS C or better.

Table 5 presents a summary of the results of the intersection analysis. Note that for the purposes of this analysis, the intersections for Alternatives C3(a), C3(b), C4, and D1 were assumed to have similar traffic patterns and use levels. The same assumptions are made for Alternatives F1 and F3. These are represented by one set of summary numbers ("Site Intersection") in Table 5. For the ferry alternatives, the "Site Intersection" line applies only to the new intersection with Tongass Avenue at Peninsula Point.

### *5.2.2 No Build Condition*

The same intersections analyzed for existing conditions (see Section 5.2.1) were analyzed for the year 2025 No Build Alternative. Results are presented in Table 5, and are summarized below:

- The Deermount Street southbound left turn move would be at LOS F (55-second delay).
- At Bawden Street, side street approaches would be at LOS F (112-second delay eastbound, 209-second delay westbound).
- At Main Street, eastbound side street approach would be at LOS E (40-second delay).
- At Schoenbar Road, the southbound right turn move would be at LOS F (169-second delay), and the northbound approach from the Taquan Air drive and southbound left turns from Schoenbar Road would also be at LOS F, albeit with only 13 and 12 peak hour vehicles, respectively.
- At Third Avenue, the southbound left turn would be at LOS F, but for only one peak hour vehicle.
- Carlanna Lake Road (57-second delay) would operate at LOS E.
- The Bryant Street southbound left move would be at LOS F (169-second delay).
- At the Existing Ferry Access, traffic exiting to Tongass Avenue would be at LOS F (92-second delay).
- All other moves for these and the other intersections in the analysis would operate at LOS D or better.

### *5.2.3 Build Alternatives – C3(a), C3(b), C4, and D1*

The results of the analysis presented in Table 5 for low, medium, and high growth scenarios do not vary significantly and the same intersections analyzed for existing conditions were analyzed for these alternatives. Examination of the high growth scenario for these alternatives reveals:

- The Deermount Street southbound left turn move would be at LOS F (82-second delay).
- At Bawden Street, side street approaches would be at LOS F (205-second delay eastbound, 424-second delay westbound).

- At Main Street, eastbound and westbound side street approaches would be at LOS F (66-second delay) and E (40-second delay), respectively.
- At Schoenbar Road, all side street moves would be at LOS F. Tongass Avenue moves would be at LOS B and C.
- At Third Avenue, the southbound left turn would be at LOS F, but for only one peak hour vehicle.
- Carlanna Lake Road (76-second delay) would operate at LOS E.
- The Bryant Street southbound left move would be at LOS F (438-second delay).
- At the assumed "Site Intersection" providing access to the bridge, traffic exiting to Tongass Avenue would also be at LOS F.
- All other moves for these and the other intersections in the analysis would operate at LOS D or better.

### *5.2.4 Build Alternatives F1 and F3*

The results of the analysis presented in Table 5 for low, medium, and high growth scenarios do not vary significantly and the same intersections analyzed for existing conditions were analyzed for these alternatives. Examination of the high growth scenario for these alternatives reveals:

- The Deermount Street southbound left turn move would be at LOS F (277-second delay).
- At Bawden Street, side street approaches would be at LOS F (937-second delay eastbound, 954-second delay westbound).
- At Main Street, eastbound and westbound side street approaches would be at LOS F (156 and 71-second delays, respectively).
- At Schoenbar Road, all side street moves would be at LOS F. Tongass Avenue moves would be at LOS B and C.
- At Third Avenue, the southbound left turn would be at LOS F, but for only one peak hour vehicle.
- Carlanna Lake Road (77-second delay) would operate at LOS E.
- The Bryant Street southbound left move would be at LOS F (425-second delay).
- At the assumed "Site Intersection" providing access to the bridge, traffic exiting to Tongass Avenue would also be at LOS F.
- All other moves for these and the other intersections in the analysis would operate at LOS D or better.

Any comparison of results for the F1 and F3 site intersections are misleading because the volumes would essentially be the same. The difference in orientation, however (the F1 approach coming from the east and the F3 approach coming from the west), would result in complimentary turns. That is, left and right turns in the PM (the peak hour studied in this report) at F3 would be the same left and right turns in the AM at the F1 location. The resulting traffic operations should be equivalent. Therefore, the discussion of mitigation applies to both alternatives.

**Table 5A. Unsignalized Intersection Analysis**

| | Existing Conditions | | Future No Action | | C3/C4/D1 Low Growth | | C3/C4/D1 Med. Growth | | C3/C4/D1 High Growth | | F1/F3 Low Growth | | F1/F3 Med. Growth | | F1/F3 High Growth | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| Deermount St. | | | | | | | | | | | | | | | | |
| EBLT | A | 8.3 | A | 9.1 | A | 9.2 | A | 9.2 | A | 9.3 | A | 9.4 | A | 9.7 | B | 10.2 |
| SBL | C | 21.5 | F | 55.2 | F | 66.2 | F | 72.3 | F | 82.3 | F | 85.5 | F | 142.4 | F | 277.4 |
| SBR | B | 11.3 | B | 14.2 | B | 14.8 | C | 15.0+ | C | 15.4 | C | 15.5 | C | 17.1 | C | 19.6 |
| Bawden St. | | | | | | | | | | | | | | | | |
| NBL | A | 8.0 | A | 8.5 | A | 8.6 | A | 8.6 | A | 8.7 | A | 8.7 | A | 8.9 | A | 9.2 |
| SBLTR | A | 8.3 | A | 9.1 | A | 9.3 | A | 9.4 | A | 9.5 | A | 9.3 | A | 9.6 | A | 9.9 |
| WBLTR | C | 22.3 | F | 209.1 | F | 292.8 | F | 344.1 | F | 423.6 | F | 344.1 | F | 557.4 | F | 953.5 |
| EBL | D | 29.0 | F | 112.4 | F | 147.1 | F | 172.0 | F | 204.5 | F | 185.4 | F | 327.0 | F | 937.6 |
| EBTR | B | 14.7 | C | 24.7 | D | 27.2 | D | 28.7 | D | 30.9 | D | 29.7 | E | 37.0 | F | 52.5 |
| Main St. | | | | | | | | | | | | | | | | |
| NBLT | A | 8.2 | A | 8.8 | A | 8.9 | A | 9.0 | A | 9.1 | A | 9.0 | A | 9.3 | A | 9.6 |
| SBLTR | A | 8.0 | A | 8.4 | A | 8.5 | A | 8.6 | A | 8.7 | A | 8.6 | A | 8.7 | A | 8.9 |
| WBLTR | B | 14.8 | D | 26.7 | D | 31.6 | D | 34.6 | E | 40.2 | D | 33.9 | E | 45.1 | F | 70.8 |
| EBLTR | C | 17.5 | E | 40.1 | E | 49.0 | F | 54.3 | F | 66.0 | F | 55.5 | F | 87.0 | F | 156.3 |
| Mission St. | | | | | | | | | | | | | | | | |
| NBLT | A | 9.3 | B | 11.5 | B | 11.9 | B | 12.1 | B | 12.4 | B | 12.1 | B | 12.8 | B | 13.8 |
| Schoenbar Rd. | | | | | | | | | | | | | | | | |
| EBL | B | 11.4 | C | 18.5 | C | 19.5 | C | 20.2 | C | 21.3 | C | 19.8 | C | 21.4 | C | 23.7 |
| WBL | A | 9.4 | B | 11.0 | B | 11.2 | B | 11.4 | B | 11.5 | B | 11.2 | B | 11.5 | B | 11.8 |
| NBLTR | F | 288.8 | F | * | F | * | F | * | F | * | F | * | F | * | F | * |
| SBL | F | 140.9 | F | * | F | * | F | * | F | * | F | * | F | * | F | * |
| SBR | D | 25.3 | F | 169.2 | F | 205.1 | F | 224.8 | F | 250.9 | F | 203.6 | F | 249.1 | F | 309.7 |
| Third Ave. | | | | | | | | | | | | | | | | |
| EBL | B | 10.5 | B | 13.7 | B | 14.4 | B | 14.8 | C | 15.4 | B | 14.0 | B | 14.3 | B | 14.8 |
| SBL | F | 65.0 | F | 261.5 | F | 330.7 | F | 401.7 | F | 511.3 | F | 303.8 | F | 330.7 | F | 401.7 |
| SBR | B | 12.1 | C | 15.3 | C | 16.0 | C | 16.5 | C | 17.1 | C | 15.6 | C | 15.9 | C | 16.3 |
| Bryant St. | | | | | | | | | | | | | | | | |
| EBL | A | 8.8 | A | 10.0- | B | 10.3 | B | 10.5 | B | 10.8 | B | 10.1 | B | 10.2 | B | 10.3 |
| SBL | D | 33.9 | F | 168.5 | F | 250.7 | F | 326.9 | F | 438.0 | F | 219.8 | F | 305.2 | F | 425.6 |
| SBR | B | 12.8 | C | 17.5 | C | 19.3 | C | 20.4 | C | 22.0 | C | 17.9 | C | 18.4 | C | 18.9 |

* - Delay greater than 1000 seconds per vehicle

**Table 5B. Signalized Intersection Analysis**

| | Existing Conditions | | Future No Action | | C3/C4/D1 Low Growth | | C3/C4/D1 Med. Growth | | C3/C4/D1 High Growth | | F1/F3 Low Growth | | F1/F3 Med. Growth | | F1/F3 High Growth | | G3 Low Growth | | G3 Med. Growth | | G3 High Growth | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| Dock St. | A | 4.4 | A | 5.1 | A | 5.1 | A | 5.2 | A | 5.2 | A | 5.2 | A | 5.4 | A | 5.7 | | | | | | |
| Washington St. | A | 5.3 | A | 9.4 | B | 10.0+ | B | 10.3 | B | 10.8 | B | 10.2 | B | 11.1 | B | 12.9 | | | | | | |
| Jefferson St. | B | 11.1 | B | 16.8 | B | 17.9 | B | 18.2 | B | 18.9 | B | 17.5 | B | 18.5 | B | 19.8 | C | 22.4 | C | 22.9 | C | 34.4 |
| Carlanna Lake Rd. | B | 14.6 | E | 57.3 | E | 64.1 | E | 68.7 | E | 75.7 | E | 62.5 | E | 68.7 | E | 76.7 | | | | | | |

**Table 5C. Site Intersections, Unsignalized Intersection Analysis**

| | C3/C4/D1 Low Growth | | C3/C4/D1 Med. Growth | | C3/C4/D1 High Growth | | F1/F3 Low Growth | | F1/F3 Med. Growth | | F1/F3 High Growth | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| C3/C4/D1 Site Intersection | | | | | | | | | | | | |
| EBL | B | 10.3 | B | 10.6 | B | 11.0 | | | | | | |
| SBLR | F | 467.0 | F | 986.0 | F | * | | | | | | |
| F3 Site Intersection | | | | | | | | | | | | |
| WBLT | | | | | | | A | 9.4 | A | 9.9 | B | 10.6 |
| NBLT | | | | | | | F | 56.2 | F | 321.2 | F | 960.6 |
| F1 Site Intersection | | | | | | | | | | | | |
| EBLT | | | | | | | A | 9.0 | A | 9.5 | B | 10.3 |
| SBLR | | | | | | | C | 23.4 | F | 87.2 | F | 504.3 |

* - Delay greater than 1000 seconds per vehicle
- Intersection does not exist in this alternative

**Table 5C Continued. Site Intersections, Unsignalized Intersection Analysis**

| | Existing Conditions | | Future No Action | | G2 Low Growth | | G2 Med. Growth | | G2 High Growth | | G3 Low Growth | | G3 Med. Growth | | G3 High Growth | | G4 Low Growth | | G4 Med. Growth | | G4 High Growth | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay |
| Exist. Ferry Terminal | | | | | | | | | | | | | | | | | | | | | | |
| WBLT | A | 9.2 | B | 10.8 | B | 10.5 | B | 10.6 | B | 10.9 | B | 10.3 | B | 10.3 | B | 10.4 | B | 10.9 | B | 10.9 | B | 11.6 |
| NBLR | C | 23.0 | F | 91.6 | D | 26.0 | D | 26.1 | E | 35.7 | E | 37.6 | E | 38.5 | E | 47.2 | F | 100.5 | F | 125.9 | F | 507.6 |
| G2 Site Intersection | | | | | | | | | | | | | | | | | | | | | | |
| WBLT | | | | | B | 10.3 | B | 10.3 | B | 10.6 | | | | | | | | | | | | |
| NBLR | | | | | D | 28.6 | D | 29.5 | E | 41.8 | | | | | | | | | | | | |

- Intersection does not exist in the alternative

### *5.2.5 Build Alternative G2/Existing Ferry Access*

Access for Alternative G2 would include two locations: one at a new intersection with Tongass Avenue at Peninsula Point, and one at the existing location, which would not change. Little impact is expected to the local street network from this alternative, or any of the ferry alternatives. Therefore, analysis is limited to the new intersection and the Existing Ferry Access for all ferry alternatives. The intersection LOS is summarized in Table 5.

- At the new intersection, the LOS would be at B (10 second delay) on Tongass Avenue, and at D at the Ferry Exit (29-30 second delays) for either the low or medium growth scenarios. For the high growth scenario, LOS would remain at B (11-second delay) on Tongass avenue, and would drop to E at the Ferry Exit (42-second delay).
- At the Existing Ferry Access, the LOS would be at B (11 second delay) on Tongass Avenue, and at D at the Ferry Exit (26-second delays) for either the low or medium growth scenarios. For the high growth scenario, LOS would remain at B (11-second delay) on Tongass avenue, and would drop to E at the Ferry Exit (36-second delay).

### *5.2.6 Build Alternative G3/Existing Ferry Access*

Again, only the two intersections that would provide access to the G3 ferries have been analyzed.

- New access for Alternative G3 would be provided at the Jefferson Street intersection, where LOS would be at C (22-34 second delays) for all growth scenarios.
- The Existing Ferry Access would be at LOS B on Tongass Avenue (10-second delay) and at LOS E (37-47 second delay) for all growth scenarios.

### *5.2.7 Build Alternative G4/Existing Ferry Access*

This alternative consists of adding another ferry terminal next to the existing ferry terminal. Access to both terminals would be from the single entrance that exists today. On Tongass Avenue LOS would be at B (10-12 second delay) for all growth scenarios. For traffic exiting the terminal drive, LOS F is expected for each of the low, medium, and high growth scenarios, with delays ranging from 101 to 508 seconds.

## 6.0 Mitigation

Mitigation was explored at any intersection projected to exhibit LOS E or F flow characteristics. In some cases, these conditions would be expected with or without the project (as evidenced by No Build conditions). At some locations, significant degradation of traffic operations would occur as a direct result of a Build Alternative. This condition would result if a location were forecast to operate at an acceptable level of service under No Build conditions, but at LOS E or F with the addition of traffic projected by a Build Alternative. In each of these cases, the intersection was examined to determine if practicable improvements could be implemented to reduce the expected impacts.

In cases where an unsignalized intersection would result in a poor LOS, traffic signal installation is often considered for mitigation because the traffic phasing introduced by the signal generally separates conflicting traffic moves. New intersections created by the alternatives are assumed to be initially unsignalized for the purpose of this analysis. Due to geometric constraints, no improvements are suggested for Carlanna Lake Road.

### 6.1 Build Alternatives – C3(a), C3(b), C4, and D1

With no improvements the intersection LOS would be at E or F for Alternatives C3(a), C3(b), C4, and D1 at several intersections, including Deermount Street, Bawden Street, Main Street, Schoenbar Road, Third Avenue, Carlanna Lake Road and Bryant Street. The LOS results for the mitigation measures proposed for these alternatives are summarized in Table 6.

The proposed mitigation for key intersections is as follows:

- Deermount Street – If traffic signals were installed, traffic operations would improve to LOS A for all development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- Bawden Street – If traffic signals were installed, traffic operations would improve to LOS A for all development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- Main Street – Traffic signal operation would improve to LOS to A for each of the development scenarios. This improvement would be required with or without this project.

- Schoenbar Road – If traffic signals were installed, traffic operations would improve to LOS D for all scenarios. This improvement would be required independent of this project.

- Third Avenue – While LOS F would occur for southbound left turns, only one vehicle makes this move during the peak hour. Therefore, no mitigation is proposed.

- Carlanna Lake Road – Due to geometric constraints, no improvements are suggested.

- Bryant Street – If traffic signals were installed, traffic operations would improve to LOS A for all development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- The Site Intersection – Traffic signal operation would improve the LOS to A with the low development scenario to B with the medium and high development scenarios. This improvement would be directly related to this project.

**Table 6. Mitigation for Alternatives C3(a), C3(b), C4, & D1**

| | Control | Low Growth | | Medium Growth | | High Growth | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay | LOS | Delay |
| Deermount | Signal | A | 6.1 | A | 6.3 | A | 6.5 |
| Bawden | Signal | A | 8.2 | A | 8.3 | A | 8.5 |
| Main | Signal | A | 6.2 | A | 6.3 | A | 6.4 |
| Schoenbar | Signal | D | 37.0 | D | 39.4 | D | 42.6 |
| Bryant | Signal | A | 5.9 | A | 6.4 | A | 7.2 |
| C3, C4 & D1 Site Intersection | Signal | A | 7.2 | B | 10.8 | B | 17.6 |

## 6.2 Build Alternatives F1 and F3

Without improvements, the LOS for Schoenbar Road, Bryant Street and Bawden Street would remain at F for each of the development scenarios, while Deermount Street and Carlanna Lake Drive would remain at LOS E. The Main Street intersection would also be at LOS F, compared to LOS E under No-Build Conditions. A summary of LOS results for the mitigation proposed below is provided in Table 7.

- Deermount Street – If traffic signals were installed, traffic operations would improve to LOS A for all development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- Bawden Street – If traffic signals were installed, traffic operations would improve to LOS A for the low and medium development scenarios, and to LOS B the high development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- Main Street – Traffic signal operation would improve to LOS to A for each of the development scenarios. This improvement would be required with or without this project.

- Schoenbar Road – If traffic signals were installed, traffic operations would improve to LOS D for all scenarios. This improvement would be required independent of this project.

- Third Avenue – While LOS F would occur for southbound left turns, only one vehicle makes this move during the peak hour. Therefore, no mitigation is proposed.

- Carlanna Lake Road – Due to geometric constraints, no improvements are suggested.

- Bryant Street – If traffic signals were installed, traffic operations would improve to LOS A for all development scenarios. This improvement would be necessary to achieve acceptable traffic operations with or without this project.

- The F1/F3 Site Intersection – With the installation of a traffic signal this location would improve from LOS F to LOS A with the low development scenario, to LOS B with the medium growth scenario, and to LOS E with the high growth scenario. The LOS E would be improved to LOS C with the addition of an eastbound turn lane to the bridge. The turn lane would be for left turns with Alternative F1, and for right turns for F3. Further improvement could be gained by providing two lanes on the approach to Tongass Avenue from the Bridge. This mitigation would be directly related to this project.

**Table 7. Mitigation for Alternatives F1 & F3**

| | Control | Low Growth | | Medium Growth | | High Growth | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay | LOS | Delay |
| Deermount | Signal | A | 6.2 | A | 6.7 | A | 7.9 |
| Bawden | Signal | A | 8.2 | A | 9.3 | B | 11.6 |
| Main | Signal | A | 6.4 | A | 6.7 | A | 7.2 |
| Schoenbar | Signal | D | 37.7 | D | 43.9 | D | 53.4 |
| Bryant | Signal | A | 5.5 | A | 5.8 | A | 6.2 |
| F1 & F3 Site Intersections | Signal | A | 5.7 | B | 13.7 | F | 57.9 |
| F1 & F3 * | Signal | | | | | C | 28.1 |
| F1 & F3 ** | Signal | | | | | B | 12.9 |

* Additional eastbound turn lane from Tongass Avenue to the bridge.
** Additional eastbound turn lane from Tongass Avenue to the bridge, plus two-lane from the bridge.

## 6.3 Build Alternative G2

A summary of LOS results for the proposed mitigation is provided in Table 8. The suggested improvement would be to install traffic signals at the Existing Ferry Access. This improvement would result in LOS A for all growth scenarios, compared to LOS F expected with No Build conditions. Traffic signal installation would be recommended independent of this project, although the current delays would be significantly increased by the project.

The new intersection at Peninsula Point would only require mitigation with the high development scenario, and with traffic signal installation would operate at LOS A.

The improvements described in Sections 6.1 and 6.2 for those intersections expected to be at LOS E or F under No-Build conditions would also be required, independent of this project.

**Table 8. Mitigation for Alternative G2**

| | Control | Low Growth | | Medium Growth | | High Growth | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay | LOS | Delay |
| Ferry Access (Existing) | Signal | A | 4.5 | A | 4.6 | A | 6.8 |
| G2 Site Intersection | Signal | | | | | A | 6.0 |

### 6.4 Build Alternative G3

The suggested improvement for Alternative G3 would also be to install traffic signals at the Existing Ferry Access. A summary of LOS results for the proposed mitigation is provided in Table 9. This improvement would result in LOS A for all growth scenarios, compared to LOS F expected with No Build conditions. Traffic signal installation would be recommended independent of this project, although the delays would be significantly increased by the project.

No mitigation is proposed for the new ferry access provided at Jefferson Street.

The improvements described in Sections 6.1 and 6.2 for those intersections expected to be at LOS E or F under No-Build conditions would also be required for this alternative, independent of this project.

**Table 9. Mitigation for Alternative G3**

| | Control | Low Growth | | Medium Growth | | High Growth | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay | LOS | Delay |
| Ferry Access (Existing) | Signal | A | 3.8 | A | 3.8 | A | 4.2 |

### 6.5 Build Alternative G4

Traffic analysis results for the proposed mitigation are summarized in Table 10. The suggested improvement would be to install traffic signals. This improvement would result in LOS A with the low and medium development scenarios, and LOS B with the high development scenario, compared to LOS E expected with No Build conditions. Traffic signal installation would be recommended independent of this project, although the delays would be significantly increased by the project.

The improvements described in Sections 6.1 and 6.2 for those intersections expected to be at LOS E or F under No-Build conditions would also be required for this alternative, independent of this project.

**Table 10. Mitigation for Alternative G4**

| | Control | Low Growth | | Medium Growth | | High Growth | |
|---|---|---|---|---|---|---|---|
| | | LOS | Delay | LOS | Delay | LOS | Delay |
| Ferry Access (G4/Exist) | Signal | A | 6.9 | A | 7.4 | B | 16.0 |

## 7.0 Conclusions

The analysis contained in this report represents a planning level assessment of traffic conditions for the No Build, bridge, and ferry alternatives for the Gravina Access Project. More extensive data collection is required to complete traffic signal warrants and refine the analysis. Pending this information, the mitigation measures contained in this report would result in improved traffic flow in the year 2025.

Findings of the analysis are summarized below:

- The Tongass Avenue intersections with Deermount Street, Bawden Street, Main Street, Schoenbar Road, the Existing Ferry Terminal Access and Bryant Street will require traffic signal installation based on No Build/background conditions unrelated to any of the build alternatives.

- Each of the improved ferry alternatives would require traffic signal installation at the Existing Ferry Access. The G2 Alternative would also require traffic signals at the new Peninsula Point intersection under the high development scenario. The ferry alternatives, however, would generate the fewest number of trips between Gravina and Revillagigedo Islands, with estimated peak hour trips ranging from 40 to 140 (400 to 1400 daily).

- Alternatives C3(a), C3(b), C4, and D1 would each require a new intersection with traffic signals at the bridge access. These alternatives would generate 210 to 480 peak hour trips (2,100 to 4,800 daily trips).

- Alternatives F1 and F3 would require a new intersection with traffic signals at the bridge access. With a high development scenario, widening on Tongass Avenue to provide an additional lane for eastbound turns to the bridge would be needed. A two-lane approach from the Bridge to Tongass Avenue would further improve traffic operations. This alternative would result in the greatest number of trips between Gravina and Revillagigedo Islands, with a peak hour range of 210 to 670 (2,100 to 6,700 daily trips), because of the expected development of Pennock Island.

# APPENDIX A
**Traffic Maps**